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ABSTRACT

Two experiments were completed to determine whether providing classroom teachers with feedback would result in changes in both teacher and student behavior. The first experiment was designed to extend the validity of an earlier investigation by Moore et al. (1974) through replication with a new teacher population and a larger sample of male teachers. The second experiment was designed to test whether teaching effectiveness would be increased if appropriate feedback involved with generating instructional sequences appropriate for individual learners was given. In the first experiment, teachers received feedback related to their ability to control their teaching behavior and their ability to apply a theoretically based rationale in the resolution of learner problems. The experimental teachers demonstrated greater control of their teaching behavior as evidenced by the low discrepancy between their ratings of the need for intervention and their satisfaction of that need. Teachers in experiment two received feedback associated with their abilities to (1) engage in diagnostic procedures when a student incorrectly answered a question and (2) utilize appropriate diagnostic sequences to resolve the problem. There were significant differences in the direction of the experimental group, indicating that (1) experimental teachers engaged in diagnosis more often; (2) they conceptualized and employed more appropriate processes for diagnosis; and (3) their students correctly answered more previously missed items than did participants in the control group. In summary, the study demonstrated the importance of conceptually appropriate feedback in bringing about changes in teacher behavior. (MB)

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An Evaluation of the Effects of Conceptually Appropriate Feedback on Teacher and Student Behavior[1]

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AN EVALUATION OF THE EFFECTS OF CONCEPTUALLY
APPROPRIATE FEEDBACK ON TEACHER AND STUDENT BEHAVIOR

In spite of the fact that today there are more teachers licensed to teach than there are available positions, the shortage of effective teachers remains at crises proportions. Thus, for teacher educators the problem of developing systems for preparing more effective teachers continues to be a principal concern.

One effort to improve the quality of teacher education which has received must attention in recent years has been the development of programs referred to frequently as Competency Based Teacher Education programs (CBTE). Generally, the procedure involves the careful specification of competencies thought to be associated with effective teaching and then the design of programs and educational experiences considered productive in producing those competencies. Ideally, the teachers remain in the program until they can demonstrate the previously specified competencies. Realistically, particularly at the undergraduate level where time to graduate is usually held constant, teachers are graduated demonstrating varying levels of competence.

In spite of this limitation, there are a number of important reasons for specifying competencies as a basis for developing and implementing teacher education programs. One reason is that it increases the probability that teacher education programs are more likely to result in effectiveness models as opposed to the more commonplace exposure models. Possibly of greater importance is the potential of providing prospective teachers with more relevant feedback, associated with training, thus increasing both the effectiveness and the efficiency of the teacher education program.

A number of factors must be considered if feedback is to be most effective in the training program. First, if the feedback is to result in more effective teaching, the feedback must be acceptable to the teacher. Good, et al (1974) has demonstrated that if teachers " are given . . . feedback about their behavior (it) was effective in changing both quantitative and qualitative teacher behavior toward target students" (p. 405). Second, for feedback to be effective, it must be valid. Further, it can be argued that the acceptability of feedback by teachers is in part a function of the validity of the feedback. This is not to suggest that some invalid feedback would not be accepted. Rather, if valid feedback results in solutions to instructional problems, it would be expected that this would tend to reinforce its use.

While the notion of CBTE programs is predicted on the assumption that valid competencies as a basis for providing valid feedback had been specified, there is little evidence that efforts to identify valid competencies have been particularly productive. In all too many cases it would appear that competencies are judged to be acceptable if (a) they are measurable and (b) the list of competencies is extensive. The result has been the production of long lists of teaching competencies often with little evidence to indicate that they are significantly related to changes in learner performance. For example, it is reported that Weber College has developed over 250 competencies (Phi Delta Kappan, 1974) and the Pennsylvania Department of Education has compiled a list of 66 "generic teaching competencies" (Pennsylvania Department of Education, 1973).

The problem of validity of many of these long lists of competencies is examplified in the Pennsylvania list. Moore, et al., (1974)

specified a number of problems of validity in discussing the Pennsylvania competency list.

First, there was a failure to differentiate between necessary competencies for effective teaching and desirable competencies for students. For example, the ability to develop a healthy self-concept in children is listed in the Pennsylvania list as a teacher competency when it is in fact a learner competency. Second, the list fails to differentiate between enabling and terminal competencies. The consequences of failing to differentiate between enabling and terminal competencies are at least two in number. Specifically, the assessment of terminal competence assumed the assessment of the interaction of enabling competencies. Thus, where assessment is limited to individual enabling competencies, rather than the assessment of terminal competence, the critical interactions are not evaluated, thus rendering evaluation invalid. This problem is apparent on almost every page of the Pennsylvania generic teaching competency list.

A third major problem, apparent in the list, and one not unrelated to the previous two, is the listing of instances of teacher competencies as opposed to conceptualizations of teacher competencies. The consequence of listing instances of competencies as opposed to conceptualization of the competencies should be obvious. First, one is not likely to acquire (quite apart from the inefficiency of the effort) all of the instances of all of the concepts

of teacher competence. Second, and more importantly, trying to specify all instances implies that the set of instances is finite, when in reality it is infinite. Thus, if one assumes that the terminal competencies are conceptual in nature, it is both unnecessary as well as impossible to list all the instances of behavior which could be used as means of developing the terminal competencies. Rather, by listing terminal behaviors, which are conceptual in nature, a variety of instances of enabling competencies may be used to satisfy these ends.

Finally, with respect to validity, the question must be raised concerning the relation of a stated teacher competency and learner performance. Specifically, programs may be developed which are effective in producing teachers with demonstrated competencies but where there is little evidence that the acquired competencies are effective in bringing about desired changes in learner behavior. One of the current, more comprehensive efforts to relate teacher behavior to changes in learner behavior has been made by Brophy and associates at the University of Texas (1974). In those investigations observed teacher behaviors such as giving cues or asking divergent questions were correlated with learner's residual gain scores on achievement tests. While their investigations do demonstrate that teachers do differ in their abilities to change learner behavior, the amount of variance accounted for in the correlations of teaching behavior and learner gain scores has been low.

An explanation for the relatively small amount of variance accounted for may be that the teaching behavior selected for observation may not lend itself to a single interpretation or that the effectiveness while being high for some students may not be effective with all learners.

For example, giving context cues is a teaching behavior often correlated positively with learner performance. It is obvious that what the scorer, or for that matter the teacher, defines as a context cue may or may not be perceived as a cue by a given learner. Further, even if this is not the case, a cue, in a given situation, may not be effective in bringing about a desired change in learner behavior. Thus, if feedback associated with a teaching competence is to be given which will be maximally effective in helping the teacher to modify the behavior of any student, it must be of a type which does not lend itself to a variety of interpretations and which is appropriate for all teaching situations. Thus, it can be argued that while any given instance of a conceptualization of a competency may be correlated at a very low level with a learner behavior, conceptually it may correlate perfectly. It follows that it is the conceptualization which must be acquired, not the instance.

It can be suggested then for CBTE programs to be maximally effective, at least two conditions must be satisfied. First, competencies must be specified which will provide feedback to the teacher in training which will be accepted by the teacher; and second, the competencies specified as a basis for training must be appropriate for all instructional situations and must not be given to multi-interpretations.

Support for the hypotheses that the specification of competencies which would result in feedback of a type acceptable to teachers and which was conceptually appropriate for all instructional conditions was obtained in a controlled experiment completed by Moore, Schaut and Fritzges (1974). In this investigation, they argued that the common approach to specifying teaching competencies, of classifying teachers into categories of "effective" and "ineffective" and then attempting

to induce similarities and differences in teaching behaviors would not produce competencies necessary and sufficient for all instructional conditions. They argued that "The difficulties with this approach are at least two in number. First, if the sample of teaching behavior is not completely representative of effective teaching, it is probable that one will induce some teaching behaviors which are irrelevant and treat them as relevant. Second, one may inadvertently classify enabling competencies, like the use of feedback, as a terminal competence." Their procedure was to use what they referred to as a rational scientific approach and they suggested that effective teaching, independent of learner characteristics or instructional objectives could be defined in terms of only four competencies. The taxonomy of teacher competencies specified by Moore as being both necessary and sufficient for effective instruction was:

> First, a teacher must demonstrate, with a high degree of consistency, the ability to bring his own teaching behavior under control in a wide range of instructional conditions as opposed to coming under the control of the learner's behavior. For example, the teacher must not allow the bright, personable student to dominate his attention at the expense of the less gifted students. Bringing teacher behavior under control is necessary because it establishes the upper limit of the teacher's ability to observe relevant learner behavior as a basis for diagnosis. Second, a teacher must be able to generate and test productive instructional hypotheses with respect

to both individual and group attending problems as opposed to relying on a limited set of instructional strategies. For example, the teacher must be able to observe and explain the nature of the learner behavior being reinforced and the source of the probable reinforcer if more desirable substitute behaviors are to be stimulated and reinforced. Third, a teacher must be able to generate and test productive instructional hypotheses with respect to effective instructional presentation systems appropriate for the needs of individual learners. Fourth, a teacher must be able to identify and postulate solutions for problems of classroom organization as they relate to maximizing his effectiveness and efficiency in the classroom. For example, if one assumes that a teacher has the competencies necessary for generating productive instructional hypotheses related to individual learning, but is faced with thirty learners in the class five days a week, what alternative management procedures might be considered which would maximize the probability for implementing the most effective instructional system?

In the Moore experiment (1974), the data collected were associated with the first two competencies. Specifically, using volunteer inservice public school teachers (N = 56) who were randomly assigned to experimental controlled conditions, they provided "in class" feedback for the experimental group, with respect to the first two competencies, for a period of six to eight weeks. Observations as a basis for providing

feedback were completed using an instrument designed by the principal investigator. Specifically, the teacher received information concerning the discrepancy between the teacher's ratings of students as being high or low in need of teacher intervention for learning to occur and evidence of teacher intervention with those students he had specified as requiring a greater amount of teacher intervention. It was assumed that the lower the discrepancy, the greater the control. Further, the teachers received feedback associated with whether they were using a scientific approach to problem solving with respect to learner attending behavior.

To evaluate the project, trained evaluators were used who had no knowledge concerning which teachers were experimental or control. The results of the comparisons of a) observed instances of learner inattention as the measure of effectiveness of feedback associated with competency II and b) frequency of teacher intervention with students classified as high need, as a measure of competency I, resulted in significant differences for students of female teachers for the measure of competency II and a significant difference for both male and female teachers for the measure of competency I. In all cases where significant differences were observed, they favored the experimental conditions. A retention study was completed during the following academic year and in this case, all differences between the experimental control group were in the direction of the experimental treatment. One explanation given for the failure to obtain differences in student performance for the experimental male teachers in the initial evaluation of competency II was the small size of the sample of male teachers (E = 7 and C = 3).

While these data provide strong support for the general hypotheses concerned with the conceptual appropriateness and acceptability of feedback as it affects teaching behavior, a number of questions remained unanswered. First, if the sample of males had been larger in the initial experiment, would significant differences in learner attention have resulted? Second, could the positive results of this investigation be replicated with a different population? Third, were the results a function of simply the acceptability of the feedback as opposed to the conceptual appropriateness of the feedback? As pointed out earlier in this discussion, it is probable that valid feedback will be acceptable while acceptable feedback may or may not be valid. And fourth, if the major hypotheses were tested in terms of competency III, would the results be confirmed?

The purpose of the present study was to investigate these questions under controlled experimental conditions. Specifically, two experiments were completed. The first was designed to replicate the experiment of Moore, et al (1974) under conditions which provided a larger number of male subjects. The second experiment was designed to test the research hypotheses under conditions a) in which teachers received feedback with respect to "content" organization (instructional sequence) appropriate to the instructional needs of individual learners and b) in which greater control over the feedback variable was exercised.

Method:

Subjects:

Experiment 1:

Thirty-six volunteer, non-permanently certified teachers participated in experiment 1. Nineteen teachers served as members of the experimental group and 17 as control group members. Teachers were matched on the basis of sex, level taught, i.e., elementary or secondary, and number of years of experience. Twelve members of the experimental group were elementary teachers and 7 were secondary teachers. Eight teachers of this group were female and 11 teachers were male. Ten of the control group members were elementary teachers and 7 were secondary teachers; 11 were male and 6 were female teachers.

Experiment 2:

Participants in experiment 2 were 21 volunteer, non-permanently certified teachers. Teachers were matched on teaching level. Nine elementary and 2 secondary teachers formed the experimental group; 8 elementary and 2 secondary teachers participated in the control group. There were 4 males and 7 females in the experimental group and 6 male and 4 female teachers in the control group.

Procedure

Experiment 1:

The treatment condition for experiment 1 consisted of providing the teacher with a conceptualization for using feedback associated with a) controlling their own teaching behavior and b) generating and testing hypotheses associated with learner attending behavior. Further, simulated teaching experiences (Moore, et al., 1973) were provided as a means for increasing the probability that these conceptualizations would be demonstrated in an applied situation. Conceptualization training sessions consisted of three hour weekly seminars for a six week period. Finally, the teachers received feedback regarding their success in applying the acquired conceptualizations in their own classrooms. The classroom feedback conditionsincluded two one-half day sessions each week for the six week period. Project staff members conducted both the training sessions and provided the classroom feedback.

Data were collected, as a basis for classroom feedback, using the Moore teacher observation system (Moore, et al., 1974). Using the observational system, staff members provided feedback to the teacher concerning his control of his instructional behavior by comparing the actual number of teacher initiated verbal interventions, for a randomly selected group of ten students, with the teachers post-class ratings of these students regarding the amount of intervention they required for learning to occur. A large discrepancy between the indicated need and the satisfaction of that need was defined as a low level of control

and conversely a low discrepancy was defined as a higher level of control

Staff members employed the following procedures in providing feedback to a teacher regarding his ability to generate and test hypotheses regarding learner attending behavior. First, it was assumed that a problem of inattention had to be identified before any meaningful feedback could be provided with respect to the competencies involved. Second, when at least one persistent pattern of learner inattention was identified, the teacher's responses to that behavior were recorded and classified. If no variation was observed in the teacher's responses to the incidence of inattention, it was expected that this feedback to the teacher would increase the probability that he would vary his instructional procedures when his original procedure was ineffective in bring about change. If the teacher's responses were observed to vary under conditions where the pattern of learner inattention was unchanged, the teacher was provided a list of his responses, following class, and asked to explain why he had varied his responses. If no rational explanation was given, it was assumed that the feedback, associated with his "lack of an explanation," would increase the probability that the teacher would increase his efforts to develop theoretically based explanations as a basis for his actions. If a theoretical explanation was given, as judged by the staff member, it was assumed that questions associated with its unproductiveness would increase the probability that teachers would a) seek additional knowledge of the constructs necessary for generating productive hypotheses or b) diverge in considering alternative hypotheses associated with their original explanations.

Thus, the staff member raised questions which were intended to provide feedback to the teacher with respect to his alternatives. While involved in the training, the teacher could use the staff member as a source of knowledge or as a participant in a discussion concerning alternative hypotheses that could be generated to fit the situation. These feedback procedures were repeated throughout the experimental period.

In an attempt to control, in part, for the Hawthorne effect, the control group was observed by the project staff members periodically during the experimental period using the Moore teacher evaluation instrument. The teachers were not given specific feedback with respect to their teaching behavior. Remarks were limited to general statements about the classroom atmosphere.

Experiment 2:

The procedures described for experiment 1 were essentially those employed in experiment 2 except that the experimental teachers received feedback associated with their ability to generate and test instructional hypotheses with respect to the diagnosis and remediation of individual learner problems associated with content organization (instructional sequencing). Specifically, when students were observed to answer questions incorrectly the teacher's behavior was recorded with respect to a) did he continue to ask the student additional questions, b) did the types of questions asked vary, and c) did the students ultimately respond correctly to the original teacher initiated question. (Note: The term "teacher initiated questions" includes content related

questions and statements which require a student response.) Following the completion of the class the teacher received feedback regarding his teaching behavior in class in response to inappropriate or unacceptable learner behavior, and was asked to compare this behavior to his conceptualization of the effective use of feedback.

Specifically, if he asked a student a question for the purpose of evaluating the student's level of conceptualization of the instructional objective and the student responded incorrectly, the teacher was asked why he (the teacher) responded to the student's response as he did. If he had immediately asked another student the same question, he was asked how he expected this procedure to help him diagnose the learning problem of the first student. If the teacher explained that he was using the question for motivational reasons, then it was assumed that the question was not diagnostic in nature, and the teacher was asked which questions (recorded) he used for diagnosis. If the staff member observed that the teacher asked additional questions of the student who answered incorrectly, but the questions did not vary in their complexity or form, he was asked to explain why his question asking behavior had not varied. If the teacher's questioning behavior varied, even though the learner's behavior did not change, he was asked to explain his rationale for the variation. The decision at this point on the type of follow-up feedback procedure to be used was based on the same criteria outlined in experiment 1, i.e., whether or not the teacher gave a rationally sound explanation for his behavior. In this experiment, as in experiment 1, the seminars and simulation procedures provided the basis for the conceptualization of the feedback system.

To control for the effects of type of feedback, the control group

participated in experiment 1 during the same experimental period. Thus, the experimental conditions provided for the two groups were identical with the exception that the feedback for the experimental group in experiment 2 was concerned with hypotheses generations associated with content organization as it related to individual learner requirements and not to learner attending behavior.

Data Collection:

The same instruments used to provide feedback to teachers during the experimental period were used to collect data with respect to the effectiveness of the experimental treatments. Specifically, in experiment 1, as a measure of the teacher's ability to control his own behavior, the amount of teacher intervention with high and low need students was compared. Students assigned a 4 or 5 on the rating scale were considered to be high need students, those most needing teacher intervention. Students assigned a 0 or 1 were considered low need students, those needing little or no assistance for learning to occur. Teachers with a greater degree of control were those who had a low discrepancy between the indicated need of the student and the satisfaction of that need.

The measure of the effectiveness of the experimental treatment in increasing the teacher's ability to generate and test hypotheses regarding learner attending behavior was the amount of student inattention observed in the classroom. Learner attending behavior was used as a primary dependent variable because if was measurable across all subject matter and classroom situations. Further, a high correlation between learner attention and learner performance on an

academic task was noted in several studies (Morsh, et al., 1955; Lahaderne, 1968; Cobb, 1972). Finally, the specific learner behavior associated with competency II was learner attending behavior.

In order to collect reliable information regarding attending behavior, the attending and non-attending behavior of a random sample of ten students was noted at regularly scheduled intervals during the observational period.

To evaluate the effects of the experimental treatment for experiment 2, observations were made of changes in both teacher and learner behavior. The ultimate measure of the effectiveness of the experimental treatment was change in student behavior. As with the measure of attention an effort was made to select a valid measure of learner performance which could be used to compare student behavior, with respect to competence III, independent of grade level or subject and which could be reliable assessed. In this case, student's ability to answer a previously missed question was used as a measure.

As stated previously, in both experiments there was a need for evidence that a problem existed, for example, learner inattention or learner non-mastery of the instructional objectives, in order to evaluate the teacher's effectiveness in dealing with it.

The measures used to assess changes in teacher behavior, in experiment 2, included the following. First, changes in the responses of teachers to students who incorrectly answered questions were observed. Specifically, teachers attempting to evaluate student mastery of instructional objectives, who continued to ask the student questions, when the student answered incorrectly and who attempted to ascertain what a student did not understand were

classified as engaging in diagnostic transactions. These transactions were observed and recorded.

The appropriateness of the transactions was also judged and recorded by the staff members. For example, if the teacher's original question required a student to apply defining criteria in deciding whether an instance was a positive or negative instance of a concept and the student answered incorrectly, appropriate diagnostic questions might have included: a) did the student know the defining criteria and/or b) did he have a referent, i.e., a knowledge base, for one or more of the defining attributes. In this case, the teacher had moved from a higher order initial question to lower level questions and thus the sequence was appropriate.

The procedure for collecting data, for purposes of evaluation, was for staff members to observe, at the end of the experimental period, a randomly selected group of ten students of experimental and control teachers for one 45-minute period. Teachers were unaware of which students constituted the sample until after the observation had been completed. Only ten students were observed since prior experiences had indicated that attempting to collect data, of the type described previously, on the entire class decreased scorer reliability. Inter-scorer reliability, determined prior to the posttest evaluation, ranged from .88 to .92. These observation procedures were the same for both experimental and control teachers.[2]

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[2]In an effort to replicate the long term retention results reported in the Moore study (1974), the procedures reported here are being utilized to collect data on the same population during the 1974-75 academic year.

Results

Experiment 1:

An unweighted means analysis of variance was completed to determine whether providing conceptually appropriate feedback associated with valid teacher competencies was effective in increasing the teacher's ability to bring his own teaching behavior under control. For this analysis the teachers were stratified on sex, students were stratified on need and the teachers were compared in terms of the amount of attention given to students classified as being high or low in need of teacher intervention. The interaction of the need of student and experimental treatment was the comparison of primary interest in this analysis. The results of the analysis are presented in Table 1.

Insert Table 1 about here

As can be observed in Table 1, the interaction between need of student and experimental treatment was significant ($p < .01$). The Newman-Keuls posttest analysis was completed to determine significant differences between pairs of means. Significant differences ($p < .01$) were obtained. The mean amount of attention given by teachers to high and low need students is presented in Table 2.

Insert Table 2 about here

As can be observed, the experimental teachers gave a greater amount of attention to high need students than they did to low need students while this difference was not observed between the same groups for the control teachers.

To determine the effectiveness of providing feedback with respect to increasing the teacher's ability to generate instructional hypotheses associated with learner attending behavior, t-tests were completed comparing mean percentage of learner inattention for male and female teachers in the respective experimental and control groups. Because of the possible existence of a ceiling effect with regard to the dependent variable and the resulting difficulty in interpreting interactions, an analysis of variance was not used (Winer, 1962, p. 257). The results of the t-test comparisons are presented in Table 3.

Insert Table 3 about here

As can be observed in Table 3, a significant difference was obtained for the respective comparisons. The mean percentage of inattention was lower for both experimental males and experimental females than it was for the respective control groups.

Experiment 2:

To determine the effectiveness of providing relevant feedback associated with the teacher's ability to generate and test hypotheses regarding student learning problems associated with instructional sequencing, several unweighted means analyses of variance were completed. One of these analyses was completed to compare changes in student

behavior. Second, other analyses compared changes in teacher behavior.

Finally, an analyses was completed to ascertain whether any significant differences existed between experimental and control group teachers with respect to the number of teacher initiated questions which were answered incorrectly by the students. The assumption, underlying this analysis, was that if there was a significant difference between the groups in terms of the number of questions answered incorrectly by students, the results of other measures of the effectiveness of the experiment would be questionable.

In this analysis, experimental and control group teachers were stratified on sex and compared in terms of the number of teacher initiated questions to which students responded incorrectly. The results of this analysis are reported in Table 4.

Insert Table 4 about here

These results indicate that there were no significant differences between the experimental and control groups in terms of the number of questions answered incorrectly by students.

One evidence of change, in teacher behavior, compared was differences in teacher responses to students' incorrect answers. Following an incorrect response, did teachers move to another student in their questioning or did they attempt to diagnose the problem by asking the student additional questions? The results of the statistical analysis used to determine whether significant differences existed between the treatment groups, with regard to the number of times teachers initiated diagnostic transactions with students who incorrectly

answered subject matter related questions, are presented in Table 5.

Insert Table 5 about here

As can be seen in Table 5, a significant difference between experimental and control group teachers was noted. The mean number of diagnostic sequences initiated by experimental teachers (2.91) was greater than the mean number initiated by control group teachers (1.10).

Data were also compared to determine the probable appropriateness of the transactions initiated. For this analysis only diagnostic sequences, judged to be correct, were compared. Thus, it was possible to compare data for only six of the ten teachers in the control group, since only six teachers engaged in correct diagnostic sequences. Data were available for all eleven experimental teachers. Teachers were stratified on sex and compared in terms of the number of correct diagnostic sequences initiated. The results are presented in Table 6.

Insert Table 6 about here

Differences ($p < .10$) were noted between experimental and control teachers with experimental teachers engaging in more correct diagnostic sequences (2.91) than control teachers (1.67).

Finally, to determine the effects of the experimental treatment on learner performances, the experimental and control teachers, stratified on sex, were compared in terms of the number of times students correctly answered previously missed questions. The results are presented in Table 7.

Insert Table 7 about here

The results indicate that there was a difference ($p < .01$) as a function of the experimental treatment. Students of experimental teachers correctly answered previously missed questions more often ($\bar{X} = 2.27$) than did students of control teachers ($\bar{X} = .60$).

Discussion:

The data from the present studies provide support for the hypothesis that if teachers are given feedback, associated with valid competencies, predicted changes will occur in both their behavior and ultimately in the behavior of their students. These data are observable in tables 2, 3, 5, 6 and 7 where the mean performance of teachers in the experimental group and the performance of their students on the respective measures was greater than the mean performance of the corresponding comparison group.

The fact that in experiment 1 the experimental group's performance, both in terms of controlling their own behavior and in terms of their ability to modify learner attending behavior, was greater than the control group was consistent with the predicted finding and increases both the confidence which can be placed in the predictions and the generalizability of the findings. Further, the fact that male teachers' effectiveness, as measured by learner attending behavior, was greater for experimental teachers than for control teachers supports the hypothesis that the failure to obtain differences for the comparable comparisons in the Moore (1974) study was a function of the small size of the sample.

Not only were the differences between the experimental and control group statistically significant, but they were of practical significance. These practical differences can be observed first by the fact that the level of inattention noted for classrooms of experimental teachers was approximately five percent, while the level of inattention in classrooms of control teachers was approximately twenty-three percent. Second, experimental teachers interacted with high need students more than one and one-half times more often than control teachers ($\bar{x}_e$ = 4.41 vs. $\bar{x}_c$ = 2.70).

Third, not only did experimental teachers engage in more than twice as many diagnostic sequences ($\bar{x}$ = 2.91) than control teachers ($\bar{x}$ = 1.10) but also nearly twice as many experimental teachers (N = 11) engaged in correct diagnostic sequences than did control teachers (N = 6). The number of correct diagnostic transactions also approached twice as many for experimental teachers ($\bar{x}_e$ = 2.91 vs. $\bar{x}_c$ = 1.67). Finally, and most importantly, the number of items students of experimental teachers answered correctly, after first answering them incorrectly, was almost four times as great as the control group ($\bar{x}_e$ = 2.27 vs. $\bar{x}_c$ = .60).

The hypothesis that the provision of feedback that was conceptually appropriate for all instructional conditions would be more effective in bringing about change in teacher behavior than simply providing acceptable feedback was supported by the fact that in experiment 2 the performance of the experimental group was higher than the control. These findings suggest that in addition to providing acceptable feedback, as suggested by Good and Brophy (1974), it is also necessary to consider the conceptual appropriateness of the feedback if one is to have a maximum effect on teacher behavior.

Summary

In summary, these results extend the generalizability of the finding, both in terms of population and competencies, that feedback associated with valid competencies does increase the probability of bringing about desired changes in both teacher and learner behavior. Further, evidence was obtained that valid feedback, characterized by its conceptual appropriateness for all instructional conditions, resulted in a greater increase in teacher effectiveness than did feedback which was acceptable to teachers, but not completely valid for a given instructional condition.

The research also demonstrates a number of points:

1) A CBTE program, based on competencies which are conceptually appropriate for all teaching situations, can be effective in bringing about changes in both teacher and learner behavior.

2) Competencies, which are conceptual in nature, need to be specified in order to measure the interaction effects of the enabling objectives.

3) By reducing the number of competencies to a small number of conceptual competencies, i.e., the Moore taxonomy of teacher competencies, the implementation of an effective teacher education program which results in changes in learner behavior is feasible.

4) Finally, even if, in the ideal sense, a complete competency based system is not implemented, a CBTE approach which utilizes a valid feedback system does increase teacher competencies as measured by changes in learner performance.

Table 1

UNWEIGHTED MEANS ANALYSIS OF VARIANCE -- AMOUNT OF ATTENTION GIVEN BY TEACHER TO HIGH AND LOW NEED STUDENTS

Source	df	MS	F	P
Treatment (T)	1	3.38	3.41	n.s.
Need of Student (N)	1	10.11	10.21	**
Sex of Teacher (ST)	1	9.84	9.94	**
T x N x ST	1	.36	.36	n.s.
T x N	1	6.74	6.81	**
T x ST	1	3.83	3.87	n.s.
N x ST	1	6.34	6.40	*
Error	162	.99		

* $p < .05$
** $p < .01$

Table 2

MEAN AMOUNT OF ATTENTION GIVEN BY TEACHERS TO HIGH AND LOW NEED STUDENTS

	High Need Students	Low Need Students
Experimental	4.41	1.71
Control	2.70	2.51

$p < .01$

Table 3

SUMMARY OF THE T-TEST ANALYSIS COMPARING MEAN PERCENT OF INATTENTION

	Male Teacher				Female Teacher			
	N	$\bar{x}$	σ	t	N	$\bar{x}$	σ	t
Experimental	11	5.157	5.001	5.588**	8	5.616	4.183	3.679**
Control	11	26.225	11.457		6	16.140	5.999	

** $p < .01$

Table 4

UNWEIGHTED MEANS ANALYSIS OF VARIANCE -- NUMBER OF TEACHER INITIATED QUESTIONS ANSWERED INCORRECTLY BY STUDENTS

Source	df	MS	F	P
Treatment (T)	1	.98	.09	n.s.
Sex of Teacher (ST)	1	7.07	.66	n.s.
T x ST	1	7.07	.66	n.s.
Error	17	10.71		

Table 5

UNWEIGHTED MEANS ANALYSIS OF VARIANCE -- NUMBER OF TIMES TEACHERS INITIATED DIAGNOSTIC SEQUENCES FOLLOWING AN INCORRECT STUDENT RESPONSE

Source	df	MS	F	P
Treatment (T)	1	14.42	8.58	**
Sex of Teacher (ST)	1	1.04	.62	n.s.
T x ST	1	.21	.13	n.s.
Error	17	1.68		

** $p < .01$

Table 6

UNWEIGHTED MEANS ANALYSIS OF VARIANCE -- NUMBER OF CORRECT DIAGNOSTIC SEQUENCES INITIATED

Source	df	MS	F	P
Treatment (T)	1	5.51	3.70	*
Sex of Teacher (ST)	1	.79	.53	n.s.
T X ST	1	.16	.11	n.s.
Error	13	1.49		

*$p < .10$

Table 7

UNWEIGHTED MEANS ANALYSIS OF VARIANCE -- NUMBER OF TIMES STUDENTS CORRECTLY ANSWER PREVIOUSLY MISSED ITEMS

Source	df	MS	F	P
Treatment (T)	1	13.34	9.26	**
Sex of Teacher (ST)	1	.10	.07	n.s.
T x ST	1	.06	.04	n.s.
Error	17	1.44		

** $p < .01$

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